DESCRIPTION

INK-JET RECORDING DEVICE

FIELD OF THE INVENTION

The present invention belongs to a technical field relating to an ink-jet recording device provided with a substantially rectangular parallelepiped casing whose vertical length is shorter than lateral and anteroposterior directions thereof.

BACKGROUND ART

Conventionally, a recording device provided with an ink-jet recording head has often been used as a printer for personal computer or the like, for example. However, a conventional printer commonly used has required enough space as a setting place. In particular, it can be set only in a place where enough space is secured above a setting surface such as a personal computer rack. From now on, the application target of a printer will not be limited to a personal computer or the like, but be expanded to a wider range including a television, a video and the like, for example.

Consequently, there is proposed a thin printer in order to enable setting in a setting place above which there is not enough space such as a television rack and an audio rack (for example, refer to Japanese Patent Applications Laid-Open No. 2001-191613 and No. 2001-213019). This type of printer is structured such that a substantially rectangular parallelepiped casing having a shape and dimensions corresponding to the audio equipment or the like is provided and such that a paper feed tray or the like can be operated from the front side of a casing by an operator.

However, since the conventional thin printer is structured such that the casing is

merely made thin, it is hard to say that sufficient ingenuity has been exercised for arrangement of a power source substrate and a control substrate, or the like. Therefore, although the printer can be housed in an audio rack or the like, it has been hard to say that reliability is sufficient in view of influence of heat generation by the power supply substrate or the like.

Furthermore, in an ink-jet recording head, if dry ink is left in a nozzle, an ink discharging performance is deteriorated. Accordingly, the recording device is provided with a purge unit forcibly discharging ink in the nozzle, and by performing a so-called purge operation of forcibly discharging the ink inside the nozzle in the purge unit at non-recording time, the performance of the recording head is maintained, and by causing the ink after purge to be absorbed in an absorber, the ink is prevented from leaking outside.

By the way, in the recording device provided with the purge unit, considering long-term use, since the amount of ink purged from the recording head is never small, an absorber thereof requires a size or a capacity capable of absorbing a certain amount of ink. In the conventional printer, therefore, a large volume of absorber is provided in a bottom part of the casing to make the absorber absorb the ink after purge.

However, when the large volume of absorber is arranged in the bottom part of the casing, a certain setting space in the casing bottom part is required, which increases a height of the device. Therefore, a further reduction in thickness of the device has been difficult. On the other hand, if the capacity of the absorber is decreased to reduce the thickness, there is a possibility that ink leakage occurs, thereby causing a problem with reliability.

The present invention is made in light of the above-mentioned points, and its object is to reduce the thickness of the device while increasing the reliability in the recording device provided with a substantially rectangular parallelepiped casing as

described above.

DISCLOSURE OF THE INVENTION

An ink-jet recording device according to the present invention comprises a substantially rectangular parallelepiped casing whose vertical length is shorter than lateral and anteroposterior lengths thereof, an ink-jet recording head provided inside of the casing, a tray which is arranged under the recording head inside of the casing and supports a recording medium on which recording is performed by the recording head, a moving mechanism moving the tray in the casing anteroposterior direction so that the tray passes through a position under the recording head, and a power supply substrate arranged above the tray inside of the casing.

According to the recording device, since the power supply substrate is arranged above the tray, heat of the power supply substrate is hardly transmitted to the tray. Therefore, the tray is hardly affected by the heat of the power supply substrate. Accordingly, adverse influence by the heat generation of the power supply substrate generated with a reduction in thickness (for example, thermal deformation of the tray) can be inhibited, thereby improving reliability of the device. Furthermore, an empty space above the tray is effectively used as a setting space of the power supply substrate, thereby promoting a reduction in thickness of the device.

Furthermore, another ink-jet recording device according to the present invention comprises a substantially rectangular parallelepiped casing whose vertical length is shorter than lateral and anteroposterior lengths thereof, a carriage shaft extending in the casing lateral direction inside of the casing, a carriage which reciprocates along the carriage shaft in the casing lateral direction, an ink-jet recording head attached to the carriage, a conveying mechanism conveying a recording medium in a direction perpendicular to the

carriage shaft during recording operation onto the recording medium by the recording head to lead the recording medium to a recording position where the recording is performed by the recording head, a purge unit which is provided on one end side of the carriage shaft and purges ink of the recording head, and a first ink collector which has an ink container set on the lateral side of a conveying route of the recording medium inside of the casing and collects the ink after purge of the purge unit in the ink container.

According to the recording device, since the ink container of the first ink collector is provided on the lateral side of the conveying route of the recording medium, the ink container can be set inside of the casing so that a height (vertical length) thereof is substantially the same as the height of the casing. Accordingly, a large amount of ink is stored inside of the ink container to thereby secure a sufficient amount of collected ink, so that a reduction in thickness of the device can be accomplished while improving reliability.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. **1** is a front perspective view showing an appearance of a printer according to Embodiment 1 of the present invention.

Fig. **2** is a rear perspective view of the printer.

Fig. **3** is a front perspective view showing an internal structure of the printer.

Fig. **4** is a side elevational view of the inside of the printer.

Fig. **5** is a front perspective view showing the internal structure of the printer (a view showing a part hidden by a right side frame by removing the right side frame from Fig. 3).

Fig. **6** is a cross-sectional view showing a purge unit and a first ink collector in the printer.

Fig. 7 is a cross-sectional view showing a second ink collector in the printer.

Fig. 8 is a perspective view showing a control substrate in the printer.

Fig. 9 is a plane view of the printer.

Fig. 10 is a view equivalent to Fig. 8 which shows a modification of the control substrate.

Fig. 11 is a view equivalent to Fig. 5 which shows a modification of a connection point of a tube with respect to an ink container of the first ink collector.

Fig. 12 is a view equivalent to Fig. 6 which corresponds to the modification of Fig. 11.

Fig. 13 is a view equivalent to Fig. 6 which shows a further modification of the connection point of the tube with respect to the ink container of the first ink collector.

Fig. 14 is a view equivalent to Fig. 5 which shows a modification of the first ink collector.

Fig. 15 is a view equivalent to Fig. 3 which shows a modification of a case where a heater is provided in the vicinity of a fan.

Fig. 16 is a view equivalent to Fig. 3 which shows an internal structure of a printer according to Embodiment 2.

Fig. 17 is a cross-sectional view showing a purge unit and a platen in the printer according to Embodiment 2.

Fig. 18 is a view equivalent to Fig. 5 which shows an internal structure of a printer according to Embodiment 3.

Fig. 19 is a view equivalent to Fig. 5 which shows an internal structure of a printer according to Embodiment 4.

Fig. 20 is a perspective view showing an absorber cartridge in the printer according to Embodiment 4.

Fig. 21 is a cross-sectional view of the absorber cartridge.

Fig. 22 is a cross-sectional view showing a state in which an ink discharging needle is inserted into an ink introducing mechanism of the absorber cartridge.

Fig. 23 is a view equivalent to Fig. 1 which shows an appearance of the printer according to Embodiment 4.

Fig. 24 is a view equivalent to Fig. 1 which shows a state in which the absorber cartridge is replaced through an entrance by opening a lid in the printer according to Embodiment 4.

BEST MODE FOR CARRYING OUT THE INVENTION

EMBODIMENT 1

Fig. 1 shows an appearance of a printer 1 as an ink-jet recording device according to Embodiment 1 of the present invention. This printer 1 is of a thin type easy to house in an audio rack or the like. More specifically, a casing 10 of this printer 1 is a thin casing, and is formed into a substantially rectangular parallelepiped shape whose vertical length (height) is shorter than lateral and anteroposterior lengths thereof. Here, the height is set to not more than 1/4 the lateral length and not more than 1/3 the anteroposterior length. In a part from a front surface to an upper surface in a central part in the lateral direction of the casing 10, an opening for feeding and discharging paper, replacing an ink cartridge or the like is formed, and in the front surface and the upper surface of the casing 10, there are provided a front lid 11 and an upper lid 12 covering the opening so as to be freely opened and closed, respectively. The left and right of the casing 10 denote the left and right as seen from the front surface of the casing 10, respectively.

As shown in Fig. 2, a protruded part 13 protruding rearward is formed in a back surface 14 (rear surface) of the casing 10. As described later, this protruded part 13 covers rear ends of a paper feed cassette 200 and a disk tray 300 (refer to Figs. 3 and 4)

extending rearward beyond a rear end of a side surface of the casing **10**.

In the back surface **14** of the casing **10**, a plurality of external connection terminals **15** to **19** are arranged. More specifically, the plug-in **15** of a power supply cable and the other external connection terminals **16** to **19** are provided in a part other than the protruded part **13** in the back surface **14**. In the back surface **14** of the casing **10**, openings for exposing these external connection terminals **15** to **19** (openings for connection to the external connection terminals **15** to **19**) are formed, and the external connection terminals **15** to **19** are exposed to the outside of the casing **10** through these openings. The external connection terminals **16** to **19** are terminals for connecting the printer **1** and other equipment, and for example, are a terminal for signal line of a television or a video cartridge recorder, a terminal for computer, a terminal for network and the like. As described later, the external connection terminals **16** to **19** are terminals provided in a control substrate **600** and are arranged in line vertically.

Next, an internal structure of the printer **1** is described. As shown in Fig. **3**, inside of the casing **10**, a recording part **100**, the paper feed cassette **200** (supply cassette) housing recording paper **50** (refer to Fig. **4**) as a recording medium on which recording is performed by a recording head **101** (refer to Fig. **4**) described later in the recording part **100**, the disk tray **300** supporting a disk (for example, CD, DVD or the like) which is a recording medium different from this recording paper **50**, a purge unit **400**, a first ink collector **430**, a second ink collector **450**, a power supply substrate **500**, and the control substrate **600** are provided.

The recording part **100** is provided with the ink-jet recording head **101**(refer to Fig. **4**), an ink tank **104**, and a carriage **102** mounting and holding the recording head **101** and the ink tank **104**, and a platen **103** provided so as to be opposed to the recording head **101**. A position between this recording head **101** and the platen **103**, that is, a position

under the recording head **101** and above the platen **103** is a recording position where the recording paper **50** is recorded on by the recording head **101**. In addition, the platen **103** plays the role of supporting the recording paper **50** at this recording position. The disk supported by the disk tray **300** is also recorded on at the position between the recording head **101** and the platen **103** (as described later, the disk tray **300** moves so that the disk tray **300** passes through the position under the recording head **101**).

At end parts on both the left and right sides inside of the casing **10**, left and right side frames **21** and **22** extending in the casing anteroposterior direction are provided, respectively. A carriage shaft **23** extending in the casing lateral direction is fixed to parts on the casing front side of both the side frames **21** and **22**. The carriage **102** is structured to reciprocate along the carriage shaft **23** by a driving mechanism not shown in a state of being supported by the carriage shaft **23**. Any one of end parts of this carriage shaft **23** (here, an end part on the casing right side) is a home position of the recording head **101** and the carriage **102**. This home position is a position where the recording head **101** and the carriage **102** stand by at non-recording time.

The side frames **21** and **22** form a chassis supporting the carriage shaft **23**. More specifically, in the present specification, the chassis means a member which is a base fixing a power supply source such as a motor, a member which is a base supporting power transmission means such as gear, pulley and roller, or a member which is a base supporting a driven member such as a carriage.

A depression **105** (refer to Fig. 7) is formed in a central part of the platen **103**, and a sponge **106** is provided in this depression **105**. This sponge **106** makes up an absorbing body absorbing ink, which absorbs excessive ink which has not been absorbed in the recording paper **50** in so-called frameless printing or the like.

As shown in Fig. **4**, a conveying roller **24** is provided on the casing rear side of

the platen **103** and a paper discharging roller **25** is provided on the casing front side of the platen **103**. These conveying roller **24** and the paper discharging roller **25** convey in a direction perpendicular to the carriage shaft **23** the recording paper **50** taken out from the paper feed cassette **200** by a pick-up roller not shown. The conveying roller **24** leads the recording paper **50** to the position between the recording head **101** and the platen **103** (recording position), and the paper discharging roller **25** discharges the recording paper **50** on which recording has been performed by the recording head **101** to the front side of the casing **10**.

The paper feed cassette **200** is arranged in a bottom part inside of the casing **10** and is mounted detachably with respect to the casing **10**. A lateral width (a length in the casing lateral direction) of the paper feed cassette **200** is shorter than the lateral length of the casing **10**. Accordingly, a certain amount of empty space is formed on each of the lateral sides of the paper feed cassette **200** inside of the casing **10**. Furthermore, a length in the casing anteroposterior direction of the paper feed cassette **200** is longer than the anteroposterior length of both lateral side surfaces of the casing **10**. When the paper feed cassette **200** is mounted, a rear end part of the paper feed cassette **200** extends rearward beyond the rear ends of both the side surfaces of the casing **10** and is covered with the protruded part **13** on the back surface **14** of the casing **10**, as described above. By forming the protruded part **13** in this manner, both the lateral side surfaces of the casing **10** do not need to be extended to the same extent as the paper feed cassette **200**, so that the casing **10** can be miniaturized as much as possible.

The disk tray **300** is arranged above the paper feed cassette **200**. That is, the paper feed cassette **200** is arranged under the disk tray **300**. Furthermore, the disk tray **300** is arranged under the recording head **101** and above the platen **103**. Although according to the present embodiment, the disk tray **300** is formed of plastic, a material of

the disk tray **300** is not particularly limited. In addition, in a part on the casing front side of the disk tray **300**, a recessed part **301** into which the disk is fitted is formed. That is, the disk tray **300** supports the disk in the recessed part **301**. Furthermore, in an end surface on the casing left side of the disk tray **300**, a saw-like tooth **302** is formed. The saw-tooth **302** is coupled to a gear motor **27** via a gear **26**, and following the rotation of the gear motor **27**, the disk tray **300** goes straight and moves substantially horizontally in the casing anteroposterior direction so as to pass through the position under the recording head **101** and above the platen **103**.

The purge unit **400** has an ink sucking mechanism made of a retractable pump or the like, which is omitted in the figure, and ink is sucked from the recording head **101** by the ink sucking mechanism to be removed (purged). This purge unit **400** is arranged on the right side in the casing **10**, more particularly, under the recording head **101** located at the home position. Furthermore, the purge unit **400** is arranged outside of the paper feed cassette **200** and the disk tray **300** in the casing lateral direction (on the casing right side).

The first ink collector **430** has an ink container **435** and a sponge **431** as an absorbing body which is housed in the ink container **435** to collect the ink after purge of the purge unit **400** in the ink container **435**. According to the present embodiment, the ink container **435** is formed into a boxy body extending in the vertical direction and opened at an upper side thereof.

The ink container **435** of the first ink collector **430** is arranged on the casing rear side of the purge unit **400**. Accordingly, the ink container **435** of the first ink collector **430** is, similar to the purge unit **400**, arranged outside of the paper feed cassette **200** and the disk tray **300** in the casing lateral direction (on the casing right side). That is, the ink container **435** of the first ink collector **430** is arranged on a lateral side of the conveying route of the recording medium (the recording paper **50**) (on the right lateral side of the

casing). Furthermore, the first ink collector **430** is designed not to be under the platen **103**. Thus, in the printer **1**, the first ink collector **430** is set not to be under the conveying route of the recording medium.

The whole of the ink container **435** of the first ink collector **430** may be set outside of the conveying route of the recording medium in the casing lateral direction, while as shown in Fig. **14**, the ink container **435** may be set so that a part (in particular, an upper part) thereof is placed inside of the conveying route.

As shown in Figs. **4** and **6**, the ink container **435** of the first ink collector **430** extends from a lower position than a recording surface S1 (an upper surface) of the recording paper **50** located at the recording position to a higher position than the recording surface. In other words, a lower end surface of the ink container **435** is located at the lower position than the recording surface S1 of the recording paper **50** on the platen **103** between the conveying roller **24** and the paper discharging roller **25** and an upper end surface thereof is located at the higher position than the recording surface S1. Furthermore, the ink container **435** has almost the same height as the height of the casing **10**. The ink container **435** may be formed of a cubic shaped container, may be formed of a rectangular parallelepiped container, and the shape is not limited. A shape in which a height is longer than a lateral length, that is, a vertically long shape may be employed.

As shown in Figs. **5** and **6**, the ink container **435** is connected to the purge unit **400** via a tube **410** as an ink flow path. One end of this tube **410** is connected to an intermediate part in the vertical direction of the ink container **435**, by which the tube **410** is structured so as to supply the ink to the intermediate part in the vertical direction inside of the ink container **435**. More specifically, the tube **410** is connected between the recording surface S1 of the recording paper **50** located at the recording position (refer to Fig. **6**) and a lowest part (the lower end surface) of the ink container **435**. Furthermore, although, here,

the connection point between the tube **410** and the ink container **435** is set to be located on the same level as a connection part **411** between the tube **410** and the purge unit **400**,the connection point between the tube **410** and the ink container **435** may be set to a lower position than the connection point between the tube **410** and the purge unit **400**. The whole tube **410** excluding the connection part **411** is preferably located at the lower level than the connection part **411**.

The second ink collector **450**, as shown in Figs. **5** and **7**, has a boxy ink container **453** opened on an upper side thereof and a sponge **451** as an absorbing body which is housed inside of this ink container **453**, and is intended to collect in the ink container **453** excessive ink discharged from the recording head **101** and absorbed in the sponge **106** on the platen **103** in so-called frameless printing or the like. The ink container **453** of this second ink collector **450** is set on the opposite side of the purge unit **400** and the ink container **435** of the first ink collector **430** in the casing lateral direction, that is, on the left side in the casing **10**, more particularly, under an end part on the casing left side of the platen **103** and between the left side frame **1** and the paper feed cassette **200** (outside of the paper feed cassette **200** and the disk tray **300** in the casing lateral direction (on the casing right side)).

As shown in Fig. **7**, a felt **452** is provided between the sponge **106** on the platen **103** and the sponge **451** inside of the ink container **453**. One end part of this felt **452** is in contact with the sponge **106**, and the other end part is in contact with the sponge **451**. This felt **452** conveys the ink from the sponge **106** to the sponge **451** with a capillary force used as a conveying drive force. That is, the felt **452** makes up ink collecting means for collecting the ink absorbed in the sponge **106** on the platen **103** into the sponge **451** of the second ink collector **450**.

The power supply substrate **500** is a printed board in which a power supply circuit

for driving the printer **1** is formed and is connected to the plug-in **15** of the power supply cable. This power supply substrate **500** has a cooling fan **501** attached, as shown in Fig. **3**. In this printer **1**, a comparatively wide empty space is formed above the disk tray **300** and the power supply substrate **500** is arranged in the empty space. That is, the power supply substrate **500** is set above the disk tray **300** and is arranged on the same side (upper side) as the recording head **101** and the carriage **102** with the respect to the disk tray **300**.

The power supply substrate **500** is set in a traverse posture (posture extending in the horizontal direction). The fan **501** is provided vertically on the power supply substrate **500** so as to send air in the horizontal direction. The fan **501** is attached to an end part on the casing front side of the power supply substrate **500** and is arranged at the nearest position to the recessed part **301** of the disk tray **300**. This is intended to allow the fan **501** to cool the power supply substrate **500** and to supply warm wind to the disk from the fan **501** after recording on the disk on the disk tray **300** so as to promote drying of the ink. However, the attaching position of the fan **501** is not particularly limited.

The control substrate **600** is a printed board in which a control circuit controlling the printer **1** is provided. This control substrate **600** is provided vertically in the direction perpendicular to the carriage shaft **23** in a substrate block **602** provided between the left side frame **21** (chassis on the opposite side of the home position) and the left side surface of the casing **10**. Accordingly, the control substrate **600** is arranged at a position outside of the left side frame **21** in the casing lateral direction (on the casing left side). The control substrate **600** is an elongate substrate in the casing anteroposterior direction and has almost the same height and length as the left side surface of the casing **10**. That is, the control substrate **600** has almost the same shape and dimensions as the left side surface of the casing **10** as viewed from the casing lateral direction.

As shown in Fig. **8**, the external connection terminals **16** to **19** are arranged in line

vertically in an end part on the casing rear side of the control substrate **600**. These external connection terminals **16** to **19** are provided so as to be oriented to the casing rear side. Furthermore, in an upper end part on the casing rear side in an inner (the center side in the casing lateral direction (here, the casing right side)) surface of the control substrate **600** in the casing lateral direction, a plurality of internal connection terminals **601** connected to equipment inside of the casing **10** via signal lines are collectively arranged. These internal connection terminals **601** are connected to the recording head **101**, the gear motor **27**, the power supply substrate **500**, the purge unit **400**, a drive mechanism and a sensor which are not shown in the figure, and the like. The internal connection terminals **601** are provided so as to be oriented inward in the casing lateral direction. This makes it easy to attach and remove the cables, an optional substrate, or the like. As shown in Fig. **3**, a part of the substrate block **602** corresponding to the internal connection terminals **601** has a notched shape so that the internal connection terminals **601** are exposed.

In the case where recording is performed on the recording paper **50** in the paper feed cassette **200**, the recording paper **50** in the paper feed cassette **200** is taken out by the pick-up roller and this taken recording paper **50** is conveyed to the position between the recording head **101** and the platen **103** in the recording part **100** by the conveying roller **24**. Then, the recording head **101** discharges the ink while moving in the casing lateral direction with the movement of the carriage **102** to perform the recording on the recording paper **50** on the platen **103**. This recording paper **50** after recording is conveyed by the paper discharging roller **25** to be discharged from the front side of the casing **10**.

In the case where printing (recording) is performed on the disk, the disk tray **300** is first protruded to the front side of the casing **10** according to the rotation of the gear motor **27**. A user loads the disk on the recessed part **301** of the disk tray **300** in front of the casing **10**. Thereafter, the disk tray **300** is drawn back to the rear side once, and the

disk tray **300** gradually moves forward with the start of the recording operation to be located under the recording head **101**. At this time, the recording head **101** discharges the ink while moving in the casing lateral direction to perform the recording on the disk on the disk tray **300**. After finishing this recording, the disk tray **300** is again drawn back to the rear side to dry the disk by the fan **501**, and thereafter, the disk tray **300** is protruded to the front side of the casing **10**. Alternatively, immediately after finishing the recording, the disk tray **300** may be moved forward to be protruded to the front side of the casing **10**. Then, in the state in which the disk tray **300** is protruded to the front side of the casing, the user removes the disk after recording from the recessed part **301** of the disk tray **300**. Thereafter, the disk tray **300** is withdrawn to be housed in the casing **10**.

Accordingly, according to the present printer **1**, since the power supply substrate **500** is arranged above the disk tray **300**, the disk tray **300** is not heated from beneath by the power supply substrate **500** and thus, the heat of the power supply substrate **500** is hardly transmitted to the disk tray **300**. Therefore, there is less possibility that there arises such a problem that the disk tray **300** is deformed by the heat of the power supply substrate **500**, so that adverse influence by the heat generation of the power supply substrate **500** can be inhibited. Therefore, the reliability of the printer **1** is improved.

Furthermore, since the empty space above the disk tray **300** can be effectively used, a reduction in thickness of the printer **1** can be promoted.

Furthermore, according to the present printer **1**, since the control substrate **600** is provided vertically along the left side surface of the casing **10**, a setting space for the substrate **600** can be reduced, so that miniaturization of the device can be promoted.

Furthermore, the control substrate **600** is provided on the opposite side of the home position of the recording head **101** and the carriage **102**, so that even if the ink leaks from the recording head **101** and the purge unit **400**, there is no possibility that the ink falls

on the control substrate **600**. Therefore, the reliability of the control substrate **600** is improved. Furthermore, since the control substrate **600** is provided on the opposite side of the home position, weight balance of the whole device is improved, thereby stabilizing the device.

In addition, since the control substrate **600** is provided outside of the left side frame **21** in the casing lateral direction inside of the casing **10**, it is easy to replace or repair the control substrate **600**.

Moreover, since the internal connection terminals **601** of the control substrate **600** are arranged in the upper part of the control substrate **600**, it is easy to attach and remove the cables, the optional substrate and the like. It is also easy to confirm a state in which the cables, the optional substrate and the like are attached to the internal connection terminals **601**. Furthermore, since the internal connection terminals **601** is formed so as to be oriented inward, the cables, the optional substrate and the like can be easily attached and removed without removing the control substrate **600**.

Still further, according to the present printer **1**, the plug-in **15** of the power supply cable and the other external connection terminals **16** to **19** are provided in a part other than the protruded part **13** in the casing back surface **14**, so that as shown in Fig. **9**, even if the printer **1** is set so that the protruded part **13** is close to the vicinity of a wall surface on the casing rear side, the power supply cable and the cables connected to the external connection terminals **16** to **19** do not become hindrances and failure or loose connection of the cables hardly occur. In addition, the power supply cable and the other cables can be attached or removed with the printer **1** set in the vicinity of the wall surface. Furthermore, the external connection terminals **16** to **19** are arranged in line vertically, which makes the attachment or removal of the cables easier.

Furthermore, in the present printer **1**, since the fan **501** is provided in the power

supply substrate **500** and drying of the disk is promoted by the fan **501**, drying time of the disk can be shortened. Furthermore, instead of providing a fan only for drying the disk, the cooling of the power supply substrate **500** and the drying of the disk are performed by the fan **501**, so that the positive use of the heat of the power supply substrate **500** can promote the drying of the disk, and can reduce the fan in number.

Moreover, in the present printer **1**, the ink container **435** of the first ink collector **430** collecting the ink after purge is arranged on the lateral side of the conveying route of the recording paper **50** and is not under this conveying route, so that by extending the ink container **435** from a lower position than the recording paper **50** being conveyed to a higher position than the recording paper **50**, the vertical length can be comparatively large, and thus more ink can be collected in less setting area. Furthermore, although the vertical length is comparatively large, the ink container **435** can be set inside of the thin casing **10** and can be replaced easily.

The ink after purge of the purge unit **400** is introduced to the intermediate part in the vertical direction of the ink container **435** of the first ink collector **430**, so that since there is no head difference of the ink, the conveying of the ink from the purge unit **400** is easy. Furthermore, by housing the sponge **431** inside of the ink container **435** in combination, a back flow from the first ink collector **430** hardly occurs. Accordingly, improvement in conveying easiness of the ink and back flow prevention can be realized in a balanced manner. Furthermore, since a part from the bottom part of the ink container **435** to the part on the upper side to which the tube **410** is connected is boxy and has no opening part, the ink leakage from the first ink collector **430** hardly occurs. Moreover, since the first ink collector **430** is arranged on the casing rear side of the purge unit **400**, the purge unit **400** and the first ink collector **430** line up in the anteroposterior direction, and thus the connection between them by the tube **410** is easy and miniaturization of the device

can be attained.

Furthermore, in the present printer 1, the second ink collector 450 collecting the ink absorbed in the sponge 106 on the platen 103 is provided apart from the first ink collector 430, so that the distributed arrangement of the ink collectors can miniaturize each of the first ink collector 430 and the second ink collector 450. Accordingly, a reduction in thickness of the device can be promoted. Furthermore, design freedom is enlarged and the space inside of the casing 10 is effectively used, so that miniaturization of the device can be accomplished.

In the present embodiment, although the external connection terminals 16 to 19 are provided only in the back surface 14 of the casing 10, a part or all of the external connection terminals 16 to 19 may be provided in the front surface of the casing 10. For example, as shown in Fig. 10, the control substrate 600 may be provided with the external connection terminals 16 to 19 in both the end part on the casing front side and the end part on the rear side, respectively. That is, the plurality of external connection terminals 16 to 19 may be provided in both the end part on the casing front side and the end part on the rear side of the control substrate 600 so as to line up in the vertical direction, respectively, and in this case, openings for connection to the external connection terminals 16 to 19 in the end part on the casing front side and the end part on the rear side of the control substrate 600 (openings exposing the external connection terminals 16 to 19 to the outside of the casing 10) are formed in the front surface and the back surface 14 of the casing 10, respectively. Thus, by providing the terminals in both the front surface and the back surface 14 of the casing 10, the external connection terminals of the control substrate 600 can be increased in number. To put it in other way around, the height of the control substrate 600 can be reduced while securing the number of the external connection terminals, which can promote a reduction in thickness of the device.

Furthermore, the external connection terminal to which a cable often pulled and put in (for example, a connection cable of a digital camera or the like) is connected is arranged in the front surface, and the external connection terminal to which a cable in which frequency of pulling and putting in is comparatively less (for example, a connection cable of a television or the like) is connected is arranged in the back surface **14** of the casing **10**, so that the appearance from the front side can be improved and the handlability can be improved.

Furthermore, in the present embodiment, although the tube **410** connecting the purge unit **400** and the ink container **435** of the first ink collector **430** is connected to the intermediate part in the vertical direction of the ink container **435**, the connection point of the tube **410** to this ink container **435** is not limited to the intermediate part in the vertical direction of the ink container **435**, but can be set arbitrarily according to characteristics of the absorbing body inside of the ink container **435** of the first ink collector **430**, or the like.

For example, as shown in Figs. **11** and **12**, by attaching the one end of the tube **410** to an upper end part of the ink container **435**, the tube **410** may be provided so as to supply the ink after purge to the upper end part of the ink container **435**. This allows the ink to be absorbed from the upper part of the sponge **431** inside of the ink container **435**, so that there is less possibility that the ink leaks from the bottom part of the ink container **435**.

Furthermore, as shown in Fig. **13**, the tube **410** may be structured to supply the ink to the lower end part inside of the ink container **435** by connecting the tube **410** to the lower end part of the ink container **435**. In this case, the whole tube **410** excluding the connection part **411** between the tube **410** and the purge unit **400** is preferably at a lower level than the connection part **411**. According to this connection aspect, since the ink is conveyed only downward, conveying load of the purge unit **400** is reduced. Accordingly, the conveying of the ink from the purge unit **400** to the first ink collector **430** is easy.

Furthermore, in the case where absorbency of the absorbing body inside of the ink container **435** is large, the back flow of the ink from the first ink collector **430** hardly occurs. Therefore, the above-mentioned connection aspect is particularly effective in the case where the absorbency of the absorbing body is large.

Furthermore, in the present embodiment, although when drying the disk by the fan **501**, the power supply substrate **600** is used as a heat source, a new heat source can obviously be provided apart from the power supply substrate **600**. For example, as shown in Fig. **15**, a heater **502** may be provided in the vicinity of the fan **501**. The type of the heater **502** is not limited. However, in this case, it is advantageous that a fan cooling the power supply substrate **600** is provided separately.

EMBODIMENT 2

Fig. **16** shows Embodiment 2 of the present invention (the same parts as shown in Fig. **3** are indicated by the same reference numerals and signs and their detailed description is omitted), the second ink collector **450** in Embodiment 1 is omitted, the ink absorbed in the sponge **106** on the platen **103** is sucked and removed by the purge unit **400**, and this sucked and removed ink is collected in the ink container **435** of first ink collector **430** which is identical with the ink container for the purged ink of the recording head **101**.

More specifically, in this Embodiment 2, as shown in Fig. **17**, an intermediate plate **107** extending in the casing lateral direction is provided inside of the depression **105** of the platen **103** and in this intermediate plate **107**, a plurality of ink passing holes **108** are formed at predetermined intervals in the casing lateral direction. A space **109** collecting the ink is partitioned and formed between this intermediate plate **107** and a bottom surface of the depression **105**, and on an upper surface of the intermediate plate **107**, the sponge **106** described in Embodiment 1 is set. Accordingly, the ink absorbed in the sponge **106** is

introduced to the inside of the space **109** through the respective ink passing holes **108**. Then, a tube **110** as an ink flow path communicating the space **109** and the purge unit **400** is connected in an end part on the casing right side of the platen **103**, and the ink introduced to the inside of the space **109** is sucked and removed in the purge unit **400** through the tube **110** during operation of the purge unit **400** (at purge time). Furthermore, in the purge, since a sucking force of the purge unit **400** also acts on the sponge **106**, the ink absorbed in the sponge **106** is easily introduced to the inside of the space **109** from the respective ink passing holes **108**. The ink sucked and removed in the purge unit **400** from the sponge **106** is collected in the ink container **435** of the first ink collector **430** via the tube **410**.

Accordingly, according to the present embodiment, since the ink absorbed in the sponge **106** of the platen **103** is sucked and removed by the purge unit **400**, a large amount of ink is prevented from being retained in the sponge **106**. Therefore, the leakage of the ink from the platen **103** hardly occurs, and even if the printer **1** is inclined, the ink hardly leaks out.

Furthermore, according to the present embodiment, since the second ink collector **450** is not required, miniaturization of the device can be accomplished.

In the present embodiment, although the second ink collector **450** in Embodiment 1 is omitted, the second ink collector **450** can obviously be provided. More specifically, the ink absorbed in the sponge **106** of the platen **103** can also be collected by both the purge unit **400** (that is, the first ink collector **430**) and the second ink collector **450**.

EMBODIMENT 3

Fig. **18** shows Embodiment 3 of the present invention, in which detecting means for detecting a collected amount of ink of the first ink collector **430** is provided and the

absorbing body of the first ink collector **430** is replaceable. In the present embodiment, the second ink collector **450** similar to that of the above-mentioned Embodiment 1 is provided.

More specifically, in this Embodiment 3, the absorbing body of the first ink collector **430** is made of a plurality of sponge sheets **432** (sheet absorbers) and these plurality of sponge sheets **432** are layered inside of the ink container **435**.

In an upper part of a side wall of the ink container **435**, a pair of electrodes **433** are attached. This pair of electrodes **433** is provided with a voltage applying device applying voltage between the electrodes **433** and a resistance detecting device detecting electric resistance between the electrodes **433**, whose illustrations are omitted. The pair of electrodes **433**, voltage applying device and resistance detecting device make up the detecting means for detecting the amount of ink inside of the ink container **435**. That is, this detecting means is constructed by an electric sensor having the pair of the electrodes **433** and detecting the amount of ink based on the electric resistance between the pair of electrodes **433**.

The principle of detecting the amount of ink of this sensor is described. Since the sponge sheets **432** are made of a nonconductive material, when the sponge sheets **432** in contact with the electrodes **433** do not contain the ink, a current does not flow between the electrodes **433**. On the other hand, when the sponge sheets **432** in contact with the electrodes **433** absorb the ink, a current according to the absorbed amount of ink flows between the electrodes **433**. Accordingly, the absorbed amount of ink by the sponge sheets **432** can be detected based on the current flowing between the electrodes **433**. In other words, how much of the ink is absorbed can be estimated based on a resistance value between the electrodes **433**. That is, by the resistance value between the electrodes **433**, a collected amount of ink in the first ink collector **430** can be detected.

In the present embodiment, when the resistance value between the electrodes **433** falls below a predetermined value, a predetermined notice indicating that the first ink collector **430** is filled is given. This notice method is not particularly limited, and for example, a lamp for notice may be provided in the front surface of the casing **10** and the lamp may light when the resistance value falls below the predetermined value. Also, this may be displayed in external equipment (for example, a television, a personal computer or the like) connected via the external connection terminals **16** to **19**. Furthermore, the notice method is not limited to the display, but the notice can be given by using a sound.

By the above-mentioned notice, the user recognizes that the collected ink has filled the first ink collector **430**, and replaces the sponge sheets **432** absorbing the ink with new ones. This can reproduce the first ink collector **430**. This replacement of the sponge sheets **432** may be performed through the opening covered with the upper lid **12** in the upper surface of the casing **10** by broadening the opening up to the part above the ink container **435**, or by providing an entrance for replacement as explained in after-mentioned Embodiment 4 in a part of the upper surface of the casing **10** corresponding to the ink container **435** (refer to Figs. **23** and **24**), the replacement may be performed through the entrance.

By repeating the replacement of the sponge sheets **432**, the first ink collector **430** can be used semipermanently. Thus, on the premise of the replacement of the sponge sheets **432**, the amount of the ink collected in the first ink collector **430** itself may be small. As a result, the first ink collector **430** can be miniaturized and further miniaturization of the device can be accomplished.

Accordingly, according to the present embodiment, the user can easily and reliably recognize by the lamp for notice or the like that the collected ink has filled the first ink collector **430**. Therefore, the user can easily recognize the time when the replacement

of the sponge sheets **432** is required, and the replacing work can be performed at an appropriate time.

The absorbing body of the first ink collector **430** is not limited to the sponge sheets **432**, but may be a plurality of block-shaped sponges. Alternatively, similar to Embodiment 1, it may be a one size smaller cubic or rectangular parallelepiped sponge than the ink container **435**. Alternatively, it may be a grained absorbing body or the like. However, when it is made of a sheet absorber, the handlability of the absorbing body is increased.

In the present embodiment, although the detecting means for detecting the absorbed amount of ink is the electric sensor using the electrodes **433**, it is not limited to the electric sensor, but another means can obviously be used. For example, the number of cleanings of the recording head **101**, the number of replacements of the ink tank **104** or the like may be measured and the collected amount of ink in the first ink collector **430** may be estimated from the number of times. The detecting means of the present invention is not limited to a direct detection but includes means for performing indirect detection by such estimation.

EMBODIMENT 4

Fig. **19** shows Embodiment 4 of the present invention, in which the first ink collector is structured to be of a cartridge type which is easily replaced. In the present embodiment, the second ink collector **450** similar to that of the above-mentioned Embodiment 1 is also provided.

More specifically, in this Embodiment 4, as shown in Figs. **20** and **21**, the first ink collector is constructed by an absorber cartridge **441** provided with an ink container **436**, a cover **437** covering an opening on the upper side of the ink container **436**, and the plurality

of sponge sheets **432** housed in the ink container **436**. In the cover **437**, an atmospheric air communicating hole **438** is formed. This atmospheric air communicating hole **438** is a leak-off hole for allowing air contained in the ink delivered from the purge unit **400** to escape. Thus, by providing the atmospheric air communicating hole **438** in the cover **437**, the ink collection from the purge unit **400** to the absorber cartridge **441** is made smooth. Although in view of preventing ink leakage, it is preferable that the atmospheric air communicating hole **438** is provided on the upper side of the absorber cartridge **441**, it is not necessarily required to be provided in the cover **437** but it may be provided in the ink container **436** itself.

In a lower part of a casing front side surface of the ink container **436**, a memory **439** (storage means) with a terminal **440** attached is provided; as shown in Fig. **20**. This terminal **440** is a terminal connected to a body side terminal **442** attached to the casing **10** (refer to Fig. **19**). When the absorber cartridge **441** is mounted, the terminal **440** and the body side terminal **442** are in contact with each other, thereby enabling signal transmission. This enables reading and writing of the data in the memory **439**. This memory **439** is intended to store the amount of waste ink produced every cleaning or ink replacement, that is, the collected amount of ink collected in the ink container **436**. This information on the amount of collected ink is written in the memory **439** through the body side terminal **442** and the terminal **440**. When the amount of collected ink stored in the memory **439** exceeds the predetermined amount, the predetermined notice to promote the replacement of the absorber cartridge **441** is given to the notice means (the indication light or the like) provided on the surface of the casing **10**.

At a corner part in a lower part on the casing right front side of the ink container **436**, a recessed part is formed, and in an upper surface inside of this recessed part, an ink introducing mechanism **443** is provided. This ink introducing mechanism **443**, as shown

in Fig. 21, is constructed by an introducing tube 444 extending downward from the upper surface of the recessed part, a rubber lid 446 fitted into an ink injection port 445 which is a lower end part of this introducing tube 444, a valve 447 covering an upper opening of an introducing port formed so as to penetrate a central part of this rubber lid 446 in the vertical direction, and a spring 448 energizing this valve 447 toward the rubber lid 446. The valve 447 is energized toward the rubber lid 446 by the spring 448 in a state in which no force is applied from the outside, by which the upper opening of the introducing port of the rubber lid 446 becomes in a state closed by the valve 447. Instead of the rubber lid 446, a lid formed of a material other than rubber can obviously be used. For example, a lid formed of plastic may be used. The structure of the ink introducing mechanism 443 is not limited to the above-mentioned structure.

In addition, as shown in Fig. 22, an ink discharging needle 449 is attached to a tip end of the tube 410 extending from the purge unit 400. This ink discharging needle 449 is fixed upward and inserted into the ink introducing mechanism 443 with the mounting of the absorber cartridge 441. When the ink discharging needle 449 is inserted into the ink introducing mechanism 443, the valve 447 is pushed up by the ink discharging needle 449. As a result, the introducing port of the rubber lid 446 is opened and the purge unit 400 and the absorber cartridge 441 are communicated through the tube 410 and the ink discharging needle 449. Accordingly, a state in which the collection of the ink from the purge unit 400 to the absorber cartridge 441 is enabled is attained.

When removing the absorber cartridge 441, the valve 447 shuts the introducing port of the rubber lid 446, so that leakage of the ink from the absorber cartridge 441 is prevented.

In the upper surface of the casing 10, the entrance for taking out and setting the absorber cartridge 441 with respect to the inside of the casing 10 and a lid 20 opening and

closing this entrance are provided (refer to Figs. 23 and 24). In the present embodiment, by inserting the absorber cartridge **441** into the casing **10** downward through the entrance in a state in which the lid **20** is opened, the absorber cartridge **441** can be easily mounted. Furthermore, by pulling the absorber cartridge **441** upward in the state in which the lid **20** is opened, the absorber cartridge **441** can be easily removed. Accordingly, the absorber cartridge **441** can be easily replaced.

Accordingly, in the present embodiment, since the first ink collector is constructed by the replaceable absorber cartridge **441**, the first ink collector can be miniaturized. Furthermore, as compared with the case where only the absorbing body is replaced, handlability is increased.

Furthermore, in the above-mentioned embodiment, since the memory **439** is provided in the absorber cartridge **441** so that the absorber cartridge **441** itself has the information on the amount of collected ink of the absorber cartridge **441**, even if the absorber cartridge **441** is attached or removed as necessary, the amount of collected ink of the absorber cartridge **441** can be constantly grasped.

However, the information on the amount of collected ink of the absorber cartridge **441** can obviously be stored in a place other than the absorber cartridge **441**. For example, an identification number of the absorber cartridge **441** and the amount of collected ink of the absorber cartridge **441** may be stored in the control substrate **600**, an external personal computer or the like.

Furthermore, the information on the amount of collected ink is not necessarily required to be stored but the detecting means for detecting the amount of collected ink may be provided in the absorber cartridge **441**. For example, as in Embodiment 3,the detecting means for detecting the amount of collected ink based on the electric resistance value of the absorbing body may be provided. Furthermore, the detecting means for

detecting the amount of collected ink based on the number of cleanings of the recording head **101** or the number of replacements of the ink tank **104** may be provided.

Furthermore, when replacing the absorber cartridge **441**, the whole cartridge **441** may be replaced with a new one but only the sponge sheets **432** inside of the ink container **436** may be replaced by removing the cover **437**. That is, the ink container **436** and the cover **437** may be reused.

The embodiments of the present invention are not limited to the above-mentioned embodiments, but other embodiments obviously are possible. Furthermore, any combination of the above-mentioned embodiments is possible.

INDUSTRIAL APPLICABILITY

The present invention is useful for an ink-jet recording device provided with a substantially rectangular parallelepiped casing whose vertical length is shorter than lateral and anteroposterior lengths thereof, that is, a thin casing.